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tory methods from the point of view of their function in the organization of the landscape.

The work of the plant, for example, is partly physical and partly chemical, and depends upon both the physical and chemical properties of the soil. It also bears similar relations to the sunshine. In a general way the same may be said to be true of the animal forms. Again, the soil acts as both a physical and chemical agent in its relations to the plants and animals. The methods of the several branches of science, biology, physics, chemistry, astronomy, meteorology, mineralogy, etc., will be used, therefore, as they seem to be needed in the proper interpretation of the natural history of the area.

The students will be expected to devote at least two hours per week to this part of the work, which will be arranged for on the afternoon program. For this purpose they will meet Professors Carman, I. B. Meyers, and Bass, according to the groups in which they may be placed. The general character of the work is indicated in the different syllabi that follow in this connection.

In the course on *Pedagogics of Nature Study* it is the purpose to present the philosophy of school-teaching in accordance with the demands of science work. This will be done by means of the lecture and round-table method, one hour each day in the forenoon program. All those who select this work are expected to take at least two hours' laboratory work per week in the afternoon.

The topics selected for discussion are included in the following outline.

Pedagogics of Nature Study

Wilbur S. Jackman

OBSERVATION

Conditions. 1. (a) Physiology—the senses (b) physical. 2. The function of observation in imaging; 3. Relation of observation to inference; to the imagination: 4. Place and scope in education.

References: *Relation of Arithmetic to Elementary Science*, *Educational Review*, January, 1893. *Nature Study for the Common Schools*, Jackman (Introduction).

Nature Pictures. 1. Sources; 2. Means by which they are created in the mind; 3. Nature pictures as a basis for the various so-called school studies; 4. The inter-relations of nature pictures in time and space.

References: *Nature Study and Related Subjects*, Jackman, Part I. *Nature Study for the Common Schools*, Jackman (Introduction).

Expression. 1. The function of expression in imaging; 2. The relation of expression to observation; 3. Use and limitations of painting and drawing; 4. Appropriate subject-matter for painting and drawing and its technical treatment.

References: *Representative Expression in Nature Study*, *Educational Review*, October, 1895. *Nature Study and Related Subjects*. Part I. *Nature Study for the Common Schools*, Jackman (Introduction).

Expression (Continued). 1. Writing, its function and place; 2. Writing, technical treatment; 3. Making, its function and technical treatment: 4. Modeling, its function and technical treatment.

References: *Nature Study and Related Subjects*, Jackman, Part I. *Nature Study for the Common Schools*, Jackman (Introduction).

Measurements. 1. The function of measurement in imaging; 2. The significance of form and proportion; 3. The origin and inter-relation of arithmetical processes; 4. The sources of subject-matter in arithmetic. The use and abuse of symbols.

References: *Relation of Arithmetic to Elementary Science*, *Educational Review*, January, 1893. *Nature Study and Related Subjects*, Jackman, Part I.

Reading. 1. The function of reading in imaging, its relation to observation; 2. Learning to read, technical treatment; 3. The tests of good reading matter, examples to be selected from the library; 4. Interpretations of nature study and literature.

References: *Nature Study and Related Subjects*, Jackman, Part I. *The Correlation of Science and History, Educational Review*, May, 1895.

Study. 1. Modes of study, the purpose of study; 2. Essential conditions for study, the function of the teacher; 3. The use and limitation of books in study; 4. The personal element in study.

The Recitation. 1. The purpose of the recitation; necessary preparation; 2. The mutual relations of the class and the individual in recitation; 3..The function of the teacher in the recitation; 4. General plan of the recitation; common errors.

The Art of Criticism. 1. The basis upon which a school should be judged; 2. The basis upon which a teacher should be judged; 3. The proper modes of testing pupils; 4. Results that may be taken as a trustworthy basis for judgment.

References: *The School Grade a Fiction; Educational Review*, May, 1898.

Moral Aspects of Nature Study. 1. What should be expected, from the standpoint of morality, of pupils at the age when they enter the high school? 2. Incidental relations of Nature Study to morality and general culture. 3. Cultivation of the Will. 4. Development of Good Will.

References: *Nature Study and Related Subjects*, Jackman, Part I. *Nature Study for the Common Schools*, Jackman. *Ethics and Evolution*, John Dewey. *The Monist*, April, 1898. *Evolution and Ethics*, Huxley, *Popular Science Monthly*, November and December, 1883.

The Round Table Discussions will deal with the methods observed in the practice school, and in the laboratory work of the afternoon. In these discussions the practical aspects of Nature Study will be considered under some of the following heads:

I. Field Work in Nature Study. The landscape as a moving picture. The landscape as an organism. Chapters in its history. Human development related to the landscape.

II. Color and Form in the Landscape.—Significance of color and form. Illustrated by work done by the children in the practice school.

III. The Landscape as a Scene of Activity. Activities of plants and animals; from the isolated seed to the all-related plant. Establishment of its relations with heat, moisture, light, growth of root, stem, and leaf. The plant's time and space relations; flower and seed. External and internal adaptations of the plants. Competition. Mutual support. Activities of animals. Conditions favoring colonization; soil, water, shores, rocks, lowlands, etc. Examples: A tree as a center of colonization. The aspects of water that invite colonization. The atmosphere. Migration and extinction of colonies. Relations between plants and animals. External and internal adaptations of the animal forms.

The Courses in Physics and Chemistry

Charles W. Carmen

The courses in physics and chemistry are intended to meet the needs of those teachers who desire to introduce physical science into the common schools. It will be the aim, during the session of the Summer School, to aid the teacher in getting the information, explanations, and apparatus that he most desires, and that is best adapted to his use.

Have you met difficulties during the past year's experience as a teacher? What are they? Have you wished to perform simple experiments, but were unable to provide the apparatus? Have you thought out any definite line of work? Do you wish such a line of work planned for you? Propounding and answering questions along these lines will be the nature of the work rather than a formal course in physical science. The phenomena of nature are so numerous that it matters little what branch we take up.